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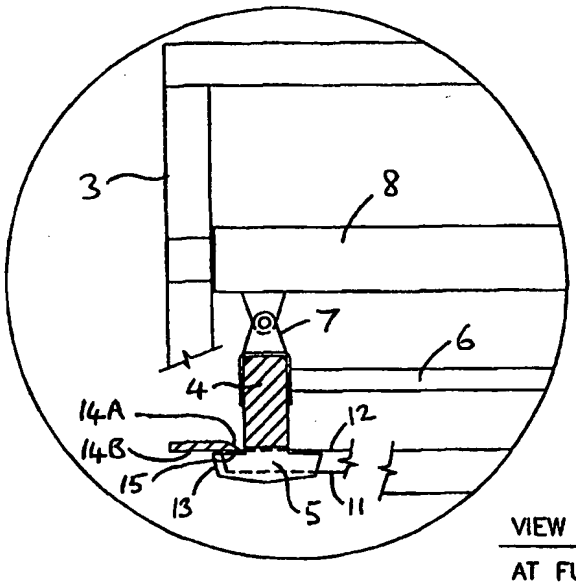

VIEW OF CLEANING ASSEMBLY AT FULL TRAVEL

(57) Abstract

A raked bar screen for a storm overflow comprises a grid of parallel spaced–apart bars (1) attached at their ends to a framework (2, 3, 14). A comb assembly (4, 5, 6) has teeth (5) which engage in the spaces between the grid bars (1). The comb assembly is longitudinally reciprocable, whereby the comb teeth can sweep longitudinally back and forth between the grid bars. The spaces between the grid bars are open at their ends. In use, sweeping of the comb teeth between the grid bars and through the open ends of the spaces therebetween drives out entrapped solid matter.

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RAKED BAR SCREEN

This invention relates to a raked bar screen for a storm overflow.

Typical sewage systems are designed to accommodate not only normal flows of waste water but also flows of storm water resulting from heavy rainfall, flooding and the like. In a typical system, a storm water overflow is positioned alongside a sewage pipe, the arrangement being known as a combined sewer overflow or CSO. In storm conditions, the level of water in the pipe rises and flows up through a horizontal bar screen and out over a weir for discharge into a receiving watercourse. In some installations, the bar screen is arranged vertically. The purpose of the bar screen is to filter out floating solid matter from the waste water and retain it in the sewage pipe, so that the receiving watercourse does not become polluted. To prevent blockage of the bar screen, comb-like devices have been designed to continuously sweep the longitudinal spaces between individual bars of the bar screen during storm conditions.

DE-A-4 215 002 discloses a raked bar screen for a storm overflow. The screen comprises a grid of parallel spaced-apart bars attached at their ends to a framework. A comb assembly is provided with teeth which engage in the spaces between the grid bars. The comb assembly is pivoted about a central point above the grid and is caused to swing to and fro by a drive unit. The comb teeth accordingly sweep longitudinally back and forth between the grid bars. While this system satisfactorily keeps the central part of the grid free from solid

blockage, it tends to sweep solid matter to each longitudinal end of the grid. As this solid matter builds up at each end, the amplitude of swing of the comb assembly is reduced. Not only is the effectiveness of filtration of the screen reduced, but mechanical stresses build up in the linkage with the drive unit, and can lead to breakdown.

GB-A-2 310 382 discloses a sewage screen having at least one pocket extending downstream of at least some portions of the screen, in relation to an intended direction of flow, to accommodate inorganic debris. Portions of the screen may slant upwardly at the ends. However, the screen is arranged in an upwardly extending overflow shaft, so solid material tends to accumulate in the pockets rather than being swept along in the flow of the sewage conduit.

The present invention provides a solution to the foregoing problems.

According to the invention, there is provided a raked bar screen for a combined sewer conduit and storm water overflow conduit, comprising a grid of parallel spaced-apart bars attached at their ends to a framework; a comb assembly having teeth adapted to engage in the spaces between the grid bars, the comb assembly being longitudinally reciprocable, whereby the comb teeth can sweep longitudinally back and forth between the grid bars from end to end; the grid bars being straight with open-ended spaces therebetween and defining a first surface of the grid on the sewer side and a second surface of the grid on the overflow

side, whereby in use sweeping of the comb teeth along and beyond the open ends of the spaces between the grid bars will drive out entrapped solid matter; the framework including solid cap portions joined to the respective ends of the bars and extending transversely thereto, and each having a flat surface which abuts and is colinear with the said second surface of the grid; and the comb teeth each having leading and trailing edges, a flat proximal edge and a distal edge, the flat proximal edge being substantially colinear with the said second surface of the grid, and the distal edge being close to the said first surface of the grid, the comb teeth being positioned such that, at their extremity of travel, the leading edges protrude through the open ends of the spaces between the bars, and the flat proximal edges contact and slide at least partly along the flat surface of a solid cap portion.

The grid may be arranged horizontally or vertically or at an intermediate angle, e.g. an angle with the vertical of 45° or less. The distal edges of the comb teeth preferably protrude through the first surface of the grid, i.e. towards the sewer.

The solid cap portion which supports the ends of the grid bars preferably incorporates a knife edge adjoining the second surface of the grid so as to scrape adhered solid matter off the flat proximal edge of the comb teeth at their extremity of travel.

The raked bar screen preferably comprises two or more banks of grid bars in

tandem, each being separated from the next by a solid cap portion, and each being longitudinally swept from end to end by a respective comb assembly.

The invention also provides a combined sewer overflow installation, comprising a sewage conduit, and a storm overflow conduit adjacent to at least part of the sewage conduit, wherein part of the sewage conduit is in communication with part of the storm overflow conduit via an overflow weir, and wherein a raked bar screen as defined above is arranged on the overflow weir or above the part of the sewage conduit which is in communication with the storm overflow conduit.

Reference is now made to the accompanying drawings, in which:

Figure 1 is a plan view of a raked bar screen according to a preferred embodiment of the invention, the grid bars not being individually shown for clarity;

Figure 2 is a side view in the form of a section on the line B-B of Figure 1;

Figure 3 is an end view in the form of a section on the line A-A of Figure 1, in which the screen is shown installed vertically on a weir wall, and the grid bars and comb teeth are not individually shown;

Figure 4 is a detailed side view of part of the apparatus at full travel of the comb

assembly;

Figure 5 is a plan view of a combined sewer overflow installation showing the screen installed horizontally;

Figure 6 is a transverse section on the line A-A of Figure 5;

Figure 7 is a plan view of a combined sewer overflow installation showing the screen installed vertically; and

Figure 8 is a transverse section on the line A-A of Figure 7.

The drawings show a double raked bar screen in which two grids formed by sets of grid bars are arranged end-to-end. This forms a single module, which can be joined with other modules if needed. The invention is, however, equally applicable to single grid bar systems and multiple grid bar systems. As shown in the drawings, two grids are each formed by an assembly of parallel spaced-apart grid bars 1 attached at their ends to a framework. The grid is arranged above a sewage conduit (as shown in Figures 5 to 8) so that, in storm conditions, as the water level rises the overflow of water is filtered by the grid. The framework comprises longitudinal lateral supports 2 and end supports 3. The grid bars 1 define a first surface 11 of the grid on the sewer side and a second surface 12 of the grid on the overflow side.

A comb assembly comprises two transverse support bars 4, on one side of the grids, and each supporting a line of attached comb teeth 5 of plastics material. The teeth 5 are mounted on the transverse support bar 4 in a spacing which corresponds to the spacing of the grid bars 1, and the teeth 5 engage respectively in the longitudinal spaces between successive grid bars 1. The teeth each have a flat proximal edge 15 which is colinear with the overflow side surface 12 of the grid, and a distal edge which protrudes slightly through the sewer side surface 11 of the grid. The transverse support bars 4 are linked by two longitudinal support bars 6. The transverse support bars 4 terminate in bearing blocks 4A which slide along and are supported by longitudinal guide bars 10. The two transverse support bars 4 cooperate respectively with the two sets of grid bars 1, so that the two sets of comb teeth 5 sweep the longitudinal spaces in the two arrays of grid bars 1, respectively. This is achieved by longitudinal reciprocation of the comb assembly. One of the transverse support bars 4 is joined by a linkage 7 to a hydraulic cylinder 8, mounted on a longitudinal support bar 9, mounted between the respective end members 3 of the supporting framework. The hydraulic cylinder 8 is driven in reciprocating fashion on the support bar 9 by a supply of hydraulic fluid (not shown). The cylinder 8 in turn drives the comb assembly. The system is switched on and off in response to water level sensors.

As shown in Figure 2, the grid bars 1 are straight and have open-ended spaces (not shown) therebetween. The grid bars define a first surface 11 of the grid on the sewer side and a second surface 12 of the grid on the overflow side. At the

extremity of travel of the comb teeth, shown in Figure 4, the leading edge 13 of each comb tooth passes completely through and beyond the open end of the respective space between the grid bars. This ensures that solid matter entrapped between the grid bars is completely swept out by the comb teeth.

The longitudinal end of each set of grid bars is joined to a transversely extending solid cap 14, which terminates in a knife edge 14A (Figure 4) adjacent the second surface 12 of the grid, with the tip of the knife edge directed towards the central portion. The knife edge 14A is arranged to overlap with part of a flat proximal surface 15 of the comb teeth 5. As a result, any solid matter which accumulates on the flat proximal surface 15 is scraped off by the knife edge 14 at full travel of the comb teeth. The flat proximal surface 15 of the comb teeth contacts and slides at least partly along a flat surface 14B of the solid cap 14, which abuts and is colinear with the second surface 12 of the grid. As the grid bars are at the same level as or only slightly above the top of the weir (Figures 6 and 8), solid material swept from between the bars by the comb teeth is immediately carried along by the flow of water in the sewage pipe.

Figures 5 and 6 show a sewage pipe 20 and storm overflow pipe 21 in a region where they communicate with each other. A weir 22 is arranged between them. Overflow water is constrained to pass through a horizontally arranged raked bar screen (as described above). The raked bar screen is positioned over the sewer at the level of the weir 22. The grid bars are at the same level as the top of the

weir 22.

Figures 7 and 8 correspond to Figures 5 and 6, except that the screen is arranged vertically on top of the weir.

CLAIMS

1. A raked bar screen for a combined sewer conduit and storm water overflow conduit, comprising a grid of parallel spaced-apart bars attached at their ends to a framework; a comb assembly having teeth adapted to engage in the spaces between the grid bars, the comb assembly being longitudinally reciprocable, whereby the comb teeth can sweep longitudinally back and forth between the grid bars from end to end; the grid bars being straight with open-ended spaces therebetween and defining a first surface of the grid on the sewer side and a second surface of the grid on the overflow side, whereby in use sweeping of the comb teeth along and beyond the open ends of the spaces between the grid bars will drive out entrapped solid matter; the framework including solid cap portions joined to the respective ends of the bars and extending transversely thereto, and each having a flat surface which abuts and is colinear with the said second surface of the grid; and the comb teeth each having leading and trailing edges, a flat proximal edge and a distal edge, the flat proximal edge being substantially colinear with the said second surface of the grid, and the distal edge being close to the said first surface of the grid, the comb teeth being positioned such that, at their extremity of travel, the leading edges protrude through the open ends of the spaces between the bars, and the flat proximal edges contact and slide at least partly along the flat surface of a solid cap portion.

2. A raked bar screen according to Claim 1, in which the grid is arranged to form an angle with the vertical of 45° or less.

3. A raked bar screen according to Claim 2, in which the grid is arranged substantially vertically.

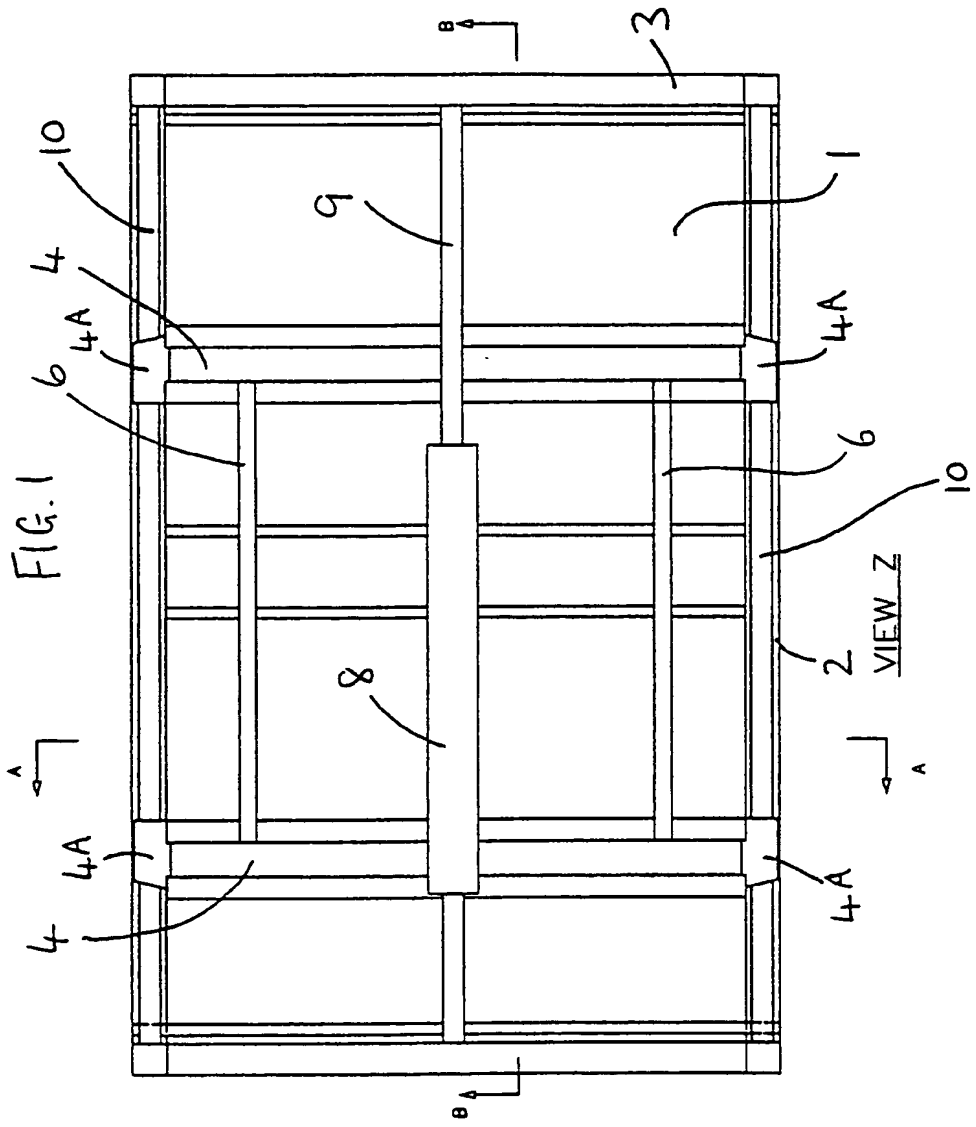
4. A raked bar screen according to any of Claims 1 to 3, in which the distal edges of the comb teeth protrude through the said first surface of the grid.

5. A raked bar screen according to any of Claims 1 to 4, in which each solid cap portion incorporates a knife edge adjoining the said second surface of the grid so as to scrape adhered solid matter off the flat proximal edge of the comb teeth at their extremity of travel.

6. A raked bar screen according to any of Claims 1 to 5, comprising two or more banks of grid bars in tandem, each being separated from the next by a solid cap portion, and each being longitudinally swept from end to end by a respective comb assembly.

7. A combined sewer overflow installation, comprising a sewage conduit, and a storm overflow conduit adjacent to at least part of the sewage conduit, wherein part of the sewage conduit is in communication with part of the storm overflow conduit via an overflow weir, and wherein a raked bar screen

according to any of Claims 1 to 6 is arranged on the overflow weir or above the part of the sewage conduit which is in communication with the storm overflow conduit.


B
3
10
9
1
4
4A
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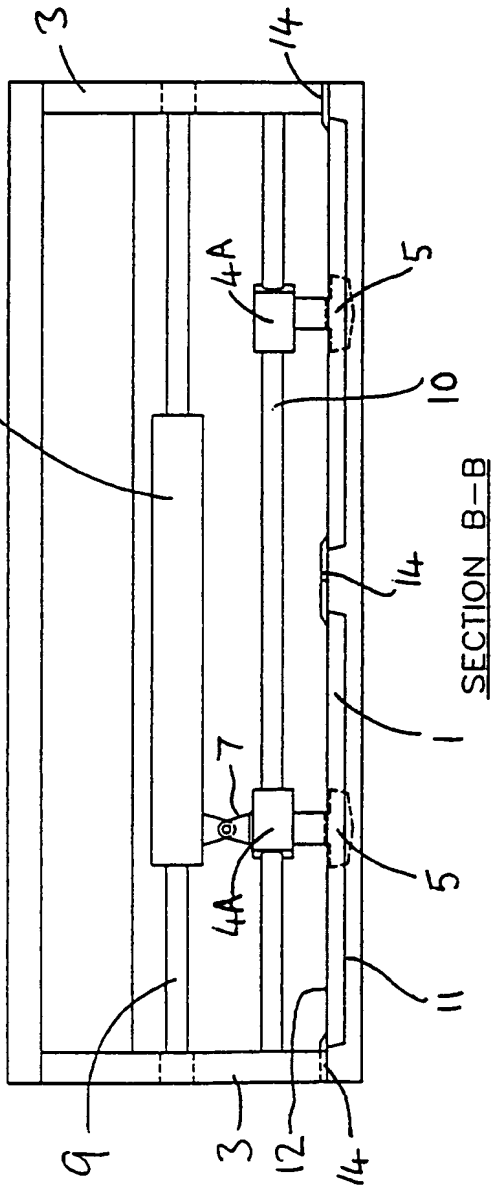
10
FIG. 1
VIEW Z
2
8
A
A
4A
4
4A
B

FIG. 2



SECTION B–B

FIG. 3

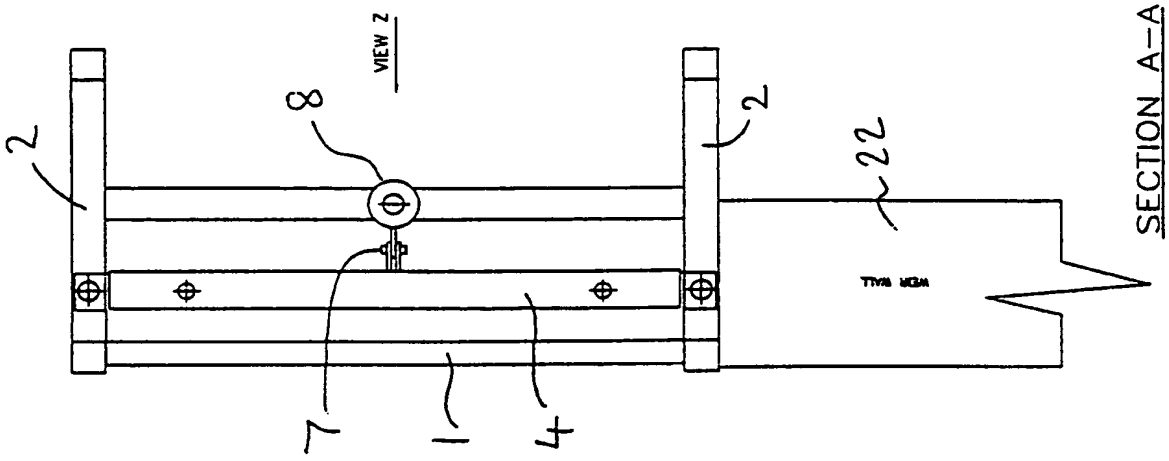


FIG. 4

VIEW OF CLEANING ASSEMBLY AT FULL TRAVEL

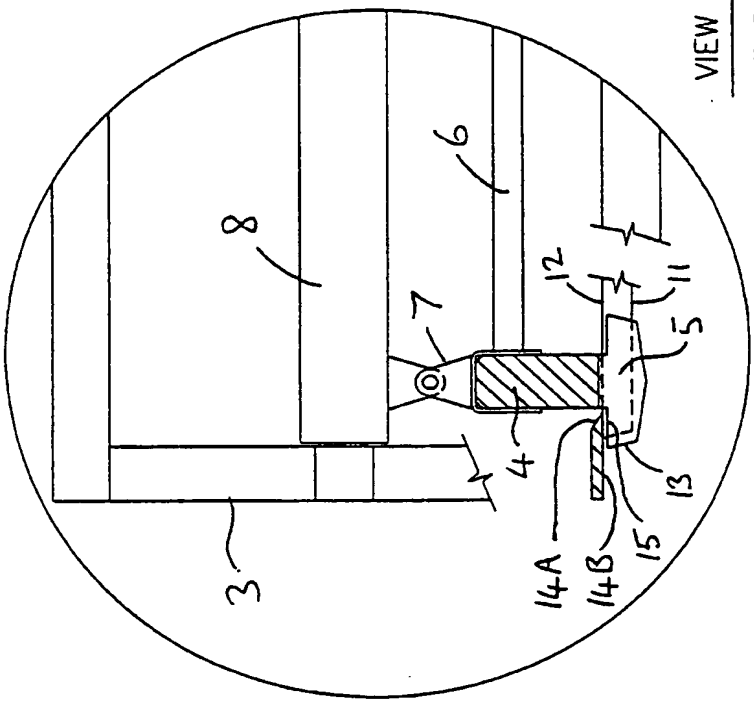
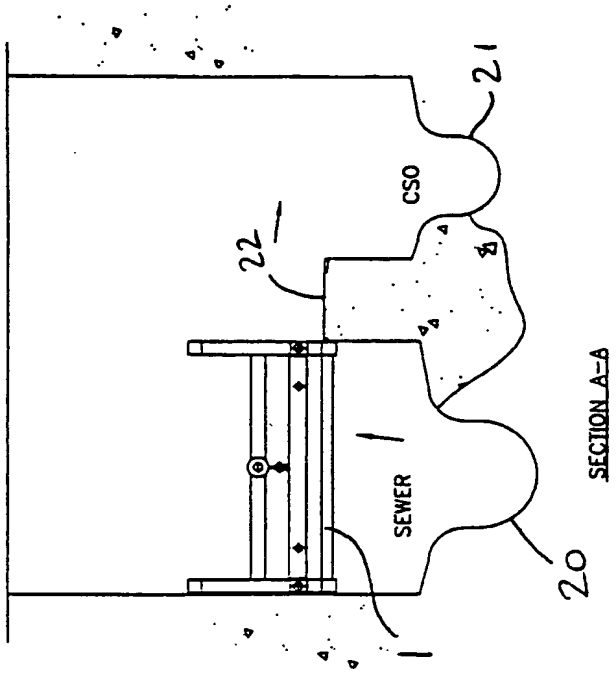


FIG. 6


21
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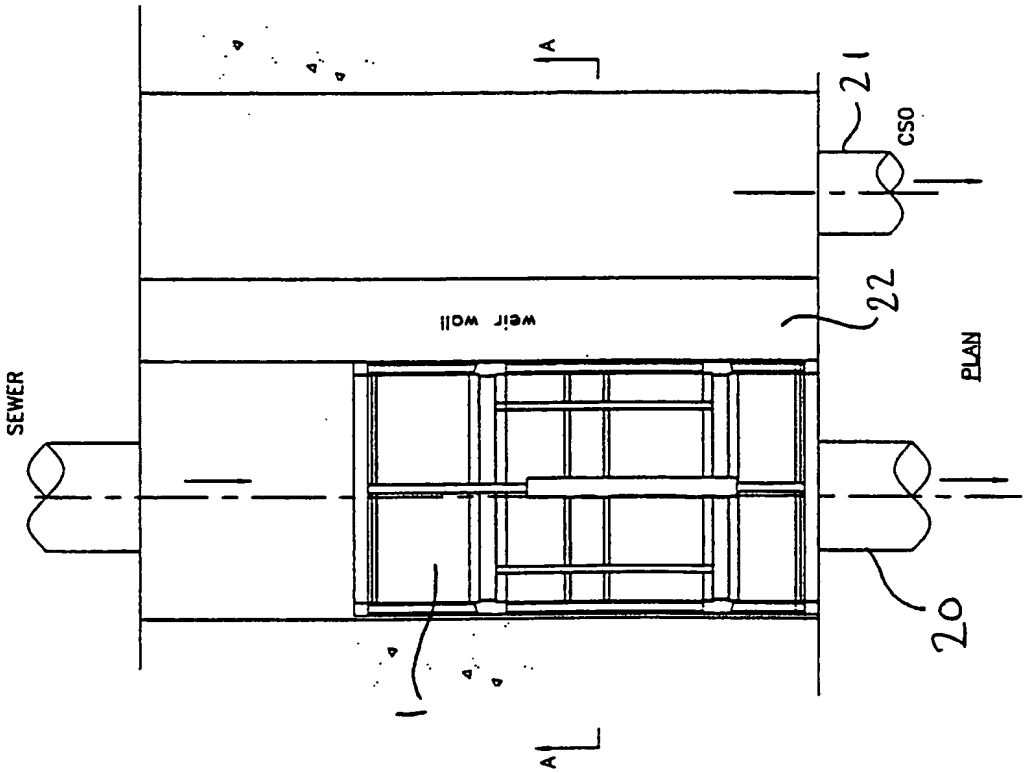
SECTION A-A

FIG. 5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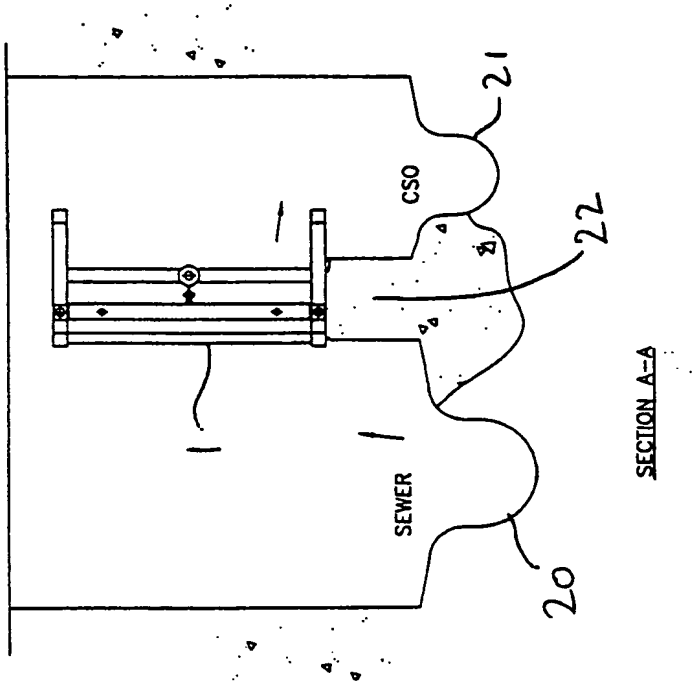
A

FIG. 8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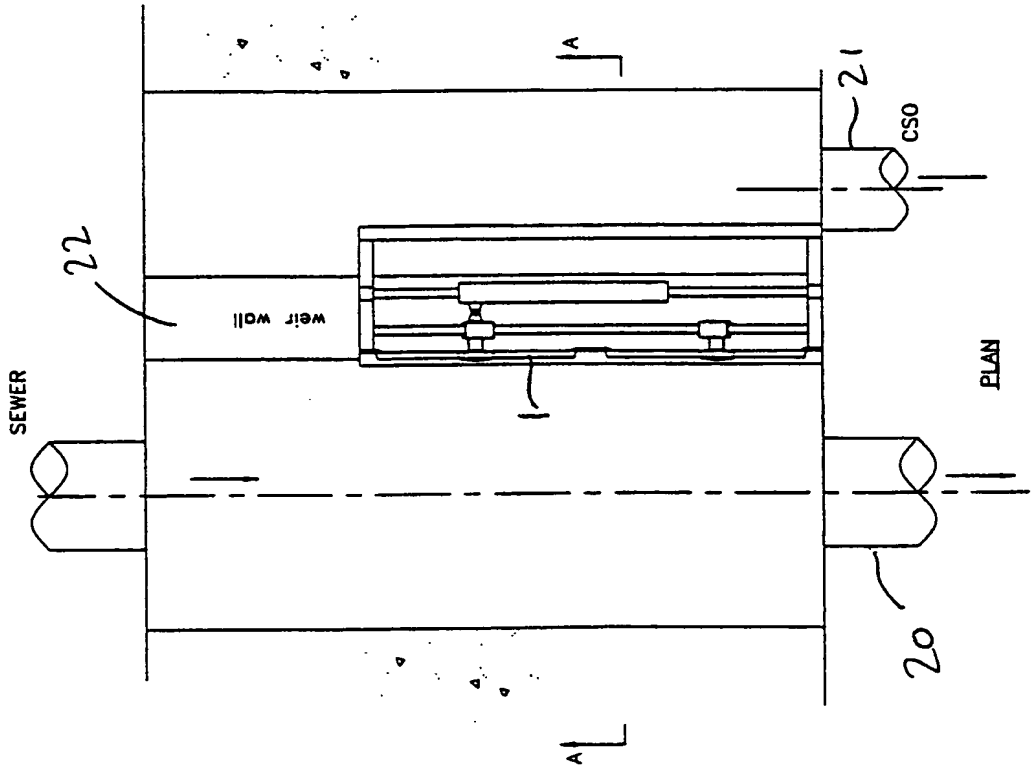
SECTION A-A

FIG. 7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INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER
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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Y		3,7
Y	WO 94 07585 A (ROMAG ROEHREN & MASCH ;GRESA LOUIS (CH)) 14 April 1994 see abstract; figures 1,3,5,6	3,7
A	GB 2 310 382 A (APOC LIMITED) 27 August 1997 cited in the application see abstract; figures	1,2,4
A	WO 95 19471 A (VA TEKNIK I BORAAS AB ;SCHELIN ANDREAS (SE)) 20 July 1995 see abstract; figures	1,2,4

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Information on patent family members

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PCT/GB 99/00847

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